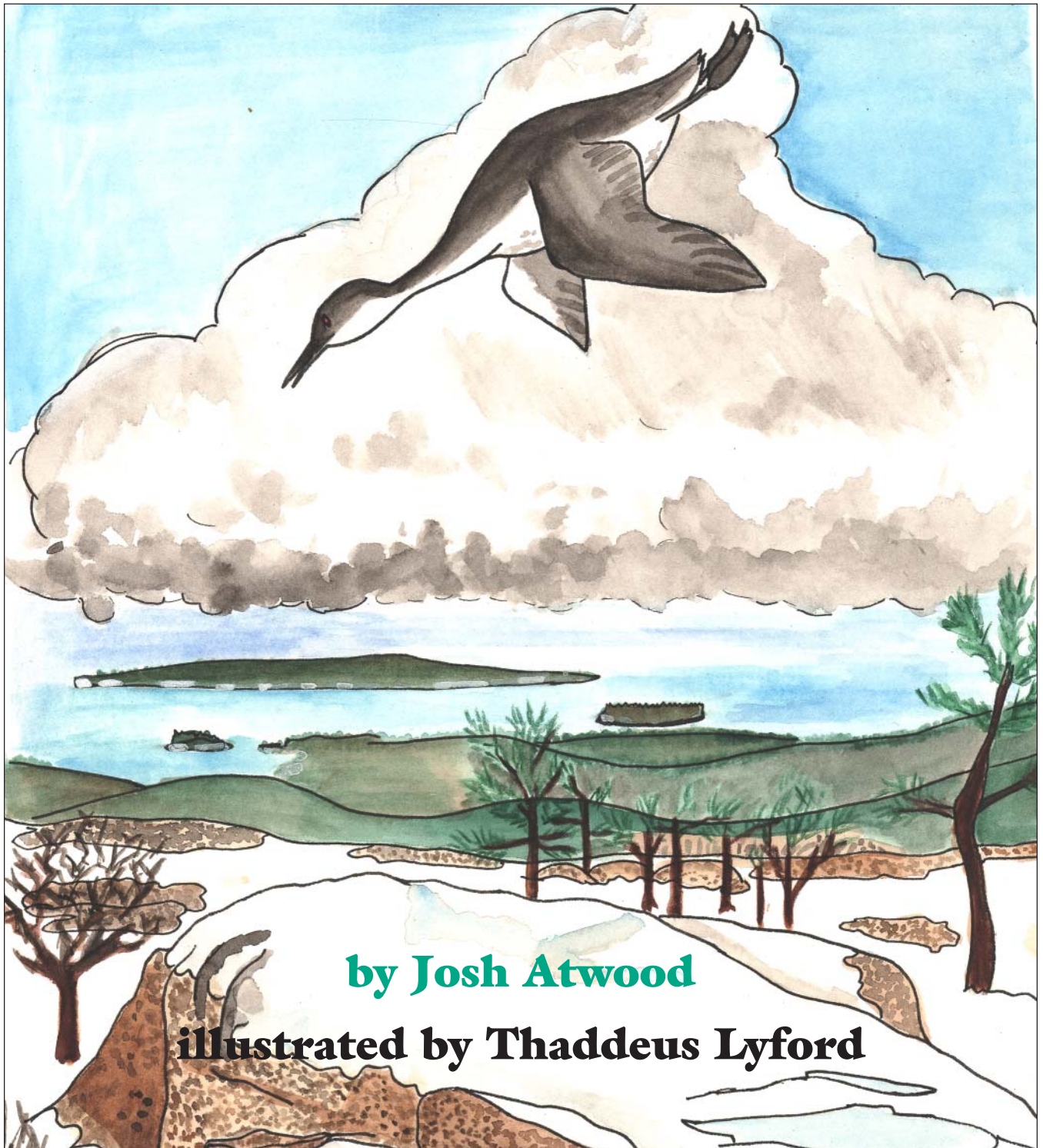


# The Watershed Journey of Linus Loon: Student Handbook



**by Josh Atwood**

**illustrated by Thaddeus Lyford**

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Additional copies of the text are available online, as are the following handbooks:

*The Watershed Journey of Linus Loon: Educator Handbook.* This handbook provides educators with background information on the ecological processes presented in the text, as well as a detailed correlation to the State of Maine Learning Results.

*The Watershed Journey of Linus Loon: Student Handbook.* This handbook contains the vocabulary words and Troll Questions for each chapter, as well as the Watershed Review. Each set of Troll Questions is accompanied by a worksheet that is formatted as a letter from the student to a Troll, providing answers to the Troll's inquiries. This handbook may be freely copied for each student in the class.

For any of these texts, please visit the Linus Loon website:  
<http://www.maine.gov/spo/mcp/resources/linus/index.php>  
Or contact Lorraine Lessard of the Maine Coastal Program, at  
[lorraine.lessard@maine.gov](mailto:lorraine.lessard@maine.gov)

**Educators and students:** Please share your thoughts on Linus and his story by leaving feedback on our website:  
<http://www.maine.gov/spo/mcp/resources/linus/index.php>



## Questions from the Lake Troll

1. Most people think that humans are at the top of the food chain. What if you were suddenly lost in the jungle with no way to defend yourself? Can you think of any predators for which humans might be prey?
2. Think about what you brought for lunch today. Can you think of all of the steps in your food chain? Remember that every food chain starts with a plant. How about your dog or cat's food chain?
3. Where do you think most of the food in your community comes from?
4. In biomagnification, why can the animals that are lower on the food chain survive, while animals that are higher up on the food chain feel the effects of the toxic chemical?
5. Some people live in different parts of the country during different seasons. If you travel to a summer home or a camp every year, you are making a trip very similar to a migrating bird. Birds travel by instinct as well as by sight and an internal compass. How do you find your way back to the same spot every year? How is this similar to or different from how a bird finds its way?

## Chapter One Vocabulary

**Ecology**—The study of interactions between the living and physical parts of the environment.

**Ecosystem**—A community of organisms and the physical environment they interact with.

**Food Chain**—A series of organisms in which each organism is eaten by the organism following it in the chain.

**Organism**—A living thing: animal, plant, fungus, or microbe.

**Predator**—An organism that hunts and feeds on another living thing.

**Prey**—An organism that is eaten by another organism.

**Consumer**—An organism that acquires energy by eating another organism.

**Producer**—An organism that acquires energy from the sun, such as plants or algae.

**Biomagnification**—A process by which substances become more concentrated in the bodies of organisms as they move up a food chain.

Name:

Date:

Dear Lake Troll,

I know you're allergic to paper, but please read my letter. I think that I know the answers to your questions...

1.

2.

3.

4.

5.

I hope this information helps you learn more about watershed ecology! Sorry about the paper...

Sincerely,



## Questions from the Bog Troll

1. The pitcher plant is one of the few carnivorous plants in Maine. Do some research and see if you can find the names of others! Make sure to find out how the other carnivorous plants trap their food!
2. Which of these terms apply to you (you can choose more than one): producer, consumer, predator, prey, primary producer, secondary producer.
3. The terms “primary production” and “secondary production” suggest that organisms are producing something. What are they making?
4. Nutrients are good for plants, and in fact plants need them to survive. But too many nutrients in a water body can result in eutrophication. This situation is similar to you and your dinner: you need food to survive, but too many cheeseburgers can lead to a stomachache. Can you think of any other examples (not related to food) where there is too much of a good thing?
5. Imagine that the sun has suddenly stopped shining. What will happen to primary production, and then what will happen to consumers?
6. How could nutrient loading happen in your community? Do a lot of people you know fertilize their lawns?



## Chapter Two Vocabulary

**Carnivorous**—Meat-eating. An adjective used to describe carnivores (organisms that eat animals).

**Tissue**—A group of cells that perform a function together. In animals, examples include skin, bone, and muscle. Examples of plant tissue include bark, xylem, and phloem.

**Primary production**—The production of plant tissue using energy from the sun. This is how energy enters all food chains.

**Secondary production**—The production of tissue using energy acquired from eating other organisms.

**Nutrients**—Material used by living organisms to grow, maintain, or repair the body of the organism. In the case of plants, “nutrients” often refers to elements such as nitrogen and phosphorous.

**Eutrophication**—The process by which a water body fills in as nutrient-rich water supports the growth of algae and plants. The decomposition of these plants by bacteria uses up the oxygen in the water.

**Nutrient loading**—The act of putting more nutrients into an ecosystem than would naturally be there. This can result in eutrophication.

Name:

Date:

Dear Bog Troll,

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Sincerely,



## Questions from the River Troll

1. Water is rarely created or destroyed; the same water flows through the water cycle over and over again. The water you drank this morning could have flowed down the Nile in ancient Egypt, or it could have been swallowed by a T-Rex, or maybe at one time it was rhinoceros sweat! Can you think of some other times and places your water could have been?
2. How are you connected to the watershed and the water cycle? Here's a hint: how does water get to your home? Where does water go that gets flushed down your drain?
3. Why do rivers and streams have more water flowing in the spring than in the summer or fall?
4. Imagine a year without rain. What would happen to the rest of the water cycle?
5. In the water cycle, water might evaporate from the ocean and come back to the ground as rainwater. Why does rainwater taste fresh if it came from the salty ocean?
6. What watershed do you live in? Look it up! (Hint: Any water that flows through your community is going somewhere, like a stream or a river. Where is your water going?)



## Chapter Three Vocabulary

**Flora**—Plant life.

**Fauna**—Animal life.

**Water Cycle**—The path water takes as it changes state and moves through the environment.

**Evaporation**—The process by which liquid water becomes gaseous water, or water vapor.

**Condensation**—The process by which water vapor becomes liquid water.

**Point source Pollution**—Pollution that comes from a single source.

Name:

Date:

Dear River Troll,

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Sincerely,



## Questions from the Estuary Troll

1. Look back at the pictures of the Bog Troll and the River Troll. Which ecosystem is more biodiverse? Remember to count plant species as well as animal species.
2. How many different species can you think of in your house or in your backyard? Count the different types of pets you have, as well any critters like gophers, and spiders. Remember to count plant species, like maples and pine trees. Don't forget to include humans as a species!
3. Have you ever heard the term "diversity" before? How was it used, and what did it mean? How is that different from or similar to biodiversity?
4. The Estuary Gnome said that there is a lot of salt in the estuary near the ocean, and not much salt in the estuary near the river. How salty is the water in the middle of the estuary?
5. Different species live in different areas of the estuary depending on how well they deal with saltwater. How much do you like salt? If you were an estuary organism, where in the estuary would you want to live?

## Chapter Four Vocabulary

**Estuary**—An ecosystem in which a freshwater river mixes with water from the ocean.

**Brackish**—An adjective describing a mixture that is part salty, part fresh.

**Salinity**—A measure of saltiness (the amount of salt in a certain amount of water).

**Biodiversity**—The range or variety of species in an area.

**Monoculture**—An ecosystem containing only one species.

Name:

Date:

Dear Estuary Troll,

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Sincerely,





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## Questions from the Ocean Troll

1. Why is it that people who contribute to nonpoint source pollution can have trouble seeing their impacts on the environment?
2. Have you noticed nonpoint source pollution in your community? Oil spots on the street or trash on the playground are examples. Can you think of others?
3. Can you think of ways that you might contribute to nonpoint source pollution?
4. What is the difference between point source and nonpoint source pollution? Can you think of some examples of each?
5. Why is nonpoint source pollution harder to take care of than point source pollution?

## **Chapter Five Vocabulary**

**Debris**—Something that has been thrown away (trash).

**Nonpoint source pollution**—Pollution that comes from many different sources.

**Pollutants**—Substances that contaminate air, water, or soil.

Name:

Date:

Dear Ocean Troll,

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Sincerely,

## The Watershed Review:

### Questions from the King Troll

The King Gnome watched Linus fly away that day, but he was not the only one with his eyes on the sky. Further down on the mountain, the King Troll was watching Linus go. He had been listening to what the King Gnome had been saying, and his head was just about to burst with questions. Being the king of all trolls, he is especially inquisitive. Can you help him?

1. Write a poem or short story that uses the following words:

Ecosystem, organism, flora, fauna, conservation.

2. Place the following words underneath the organism that they describe (coyote, rabbit, or clover). You may use the same word for more than one organism.

*Consumer, producer, carnivorous, primary production, secondary production, predator.*

Coyote

Rabbit

Clover

3. Use the following words to fill in the blanks in the sentences below. Use each word only once.

*Tissue, nutrient loading, water cycle, evaporation, condensation, brackish, salinity, biodiversity, monoculture, debris.*

- a. While a \_\_\_\_\_ only has one type of organism in it, an ecosystem with lots of different species of organisms has a lot of \_\_\_\_\_.
- b. \_\_\_\_\_ water isn't very salty, but it's not fresh water either. Its \_\_\_\_\_ is somewhere in between ocean and fresh water.
- c. In the \_\_\_\_\_, water leaves the surface of the earth by \_\_\_\_\_ and becomes vapor. Later, the water vapor becomes rain and falls back to earth through the process of \_\_\_\_\_.
- d. Primary production means that plants are using energy from the sun to create \_\_\_\_\_.
- e. \_\_\_\_\_ can happen when people put too much fertilizer on their lawns.



f. Another word for trash is \_\_\_\_\_ .

4. Draw three simple pictures using the following words. Label your drawings.

Picture #1: Pollutants, biomagnification, food chain

Picture #2: Nutrients, eutrophication

Picture #3: Point source pollution, Nonpoint source pollution

5. What does nonpoint source conservation mean to you?

### **Nonpoint source conservation**

Here are some questions about how you could help out the King Gnome and Linus:

*What could you do around the house to make sure you pollute as little as possible?*

*What could you do in your everyday life or at school to make sure you pollute as little as possible?*

*What could you do to help clean up the environment, other than your house or school?*

*The King Gnome said, "It is the duty of the gnomes to educate others about the environment." You could be an honorary gnome by telling others about environmental problems and solutions. Who could you tell about nonpoint source pollution and nonpoint source conservation?*

*Be a Gnome, Spread the Word!*

